

CLAIMS:

1. A data transfer procedure for transferring data of a data sequence between a transmitting entity and a receiving entity, which entities each comprise a higher data handling layer and a lower data handling layer, the procedure comprising:

transferring down from the higher data handling layer of the transmitting entity to the lower data handling layer of the transmitting entity a data unit of the data sequence, which data unit comprises at least one segment;

transmitting via a transmission link between the transmitting entity and the receiving entity each of the at least one segment from the lower data handling level of the transmitting entity to the lower data handling level of the receiving entity;

sending an acknowledgement of receipt of the at least one segment from the lower data handling level of the receiving entity to the lower data handling level of the transmitting entity;

transferring up the at least one segment from the lower data handling layer of the receiving entity to the higher data handling layer of the receiving entity in data sequence order;

and wherein the higher data handling layer of the transmitting entity is arranged to retain the data unit until such time as an at least implied acknowledgement of receipt of earlier segments in the sequence is sent back from the receiving entity to the lower data handling level of the transmitting entity.

2. A data transfer procedure as claimed in claim 1, wherein the higher data handling layer of the transmitting entity comprises a store for storing the data unit,

and the data unit is retained in the store until the acknowledgement of receipt has been sent back, when the data unit is then removed from the store.

3. A data transfer procedure as claimed in claim 1 or 2, wherein the at least
5 one segment of each data unit in the data sequence has a position in the data sequence, the lower data handling layer of the transmitting entity comprises a store for storing data pertaining to the position of the at least one segment transmitted therefrom, and the lower data handling layer of the receiving entity comprises a store for storing data pertaining to the position of the at least one segment received thereby.

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4. A data transfer procedure as claimed in claim 3, further comprising:
determining that the transmission link is broken; and
when the transmitting link is broken, reestablishing the transmitting link by
purging the stores of data in the lower data handling layers of both the transmitting
15 entity and the receiving entity.

5. A data transfer procedure as claimed in claim 4, wherein the transmitting
link is determined to be broken by:
the transmitting entity waiting for a period of time for the acknowledgement of
20 receipt of at least one segment from the lower data handling level of the receiving
entity;

the lower data handling level of the transmitting entity retransmitting the at
least one segment when the acknowledgement of receipt is not received;

repeating the waiting and retransmitting; and

deciding that the link is broken after the waiting and retransmitting have been repeated a number of times.

6. A data transfer procedure as claimed in claim 5, further comprising:

5 when the transmitting link is reestablished, transferring down from the higher data handling layer of the transmitting entity to the lower data handling layer of the transmitting entity a data unit of the data sequence for which an acknowledgement of receipt was not received before the transmitting link was broken.

10 7. A data transfer procedure as claimed in any preceding claim, wherein the transmitting entity is a mobile station and the receiving entity is a serving GPRS support node in a GPRS system.

15 8. A data transfer procedure as claimed in claim 7, wherein the higher data handling layers are both SNDCP layers and the lower data handling layers are both LLC layers.

20 9. A data transfer procedure for transferring to a receiving entity data of a data sequence from a transmitting entity comprising a higher data handling layer and a lower data handling layer, the procedure comprising:

transferring down from the higher data handling layer to the lower data handling layer a data unit of the data sequence, which data unit comprises at least one segment;

25 transmitting on a transmission link from the lower data handling level of the transmitting entity each of the at least one segment for the receiving entity;

receiving at the lower data handling level an acknowledgement of receipt of the at least one segment from the receiving entity;

and wherein the higher data handling layer of the transmitting entity is arranged to retain the data unit until such time as an at least implied acknowledgement
5 of receipt of earlier segments in the sequence is received from the receiving entity at the lower data handling level.

10. A data transfer procedure as claimed in claim 9, wherein the higher data handling layer comprises a store for storing the data unit, and the data unit is retained
10 in the store until the acknowledgement of receipt has been received, when the data unit is then removed from the store.

11. A data transfer procedure as claimed in claim 9 or 10, wherein the at least one segment of each data unit in the data sequence has a position in the data sequence,
15 and the lower data handling layer comprises a store for storing data pertaining to the position of the at least one segment transmitted therefrom.

12. A data transfer procedure as claimed in claim 11, further comprising:
determining that the transmission link is broken; and
20 when the transmitting link is broken, reestablishing the transmitting link by purging the stores of data in the lower data handling layer.

13. A data transfer procedure as claimed in claim 12, wherein the transmitting link is determined to be broken by:

waiting for a period of time for the acknowledgement of receipt of at least one segment from the receiving entity;

the lower data handling level retransmitting the at least one segment when the acknowledgement of receipt is not received;

5 repeating the waiting and retransmitting; and

deciding that the link is broken after the waiting and retransmitting have been repeated a number of times.

14. A data transfer procedure as claimed in claim 13, further comprising:

10 when the transmitting link is reestablished, transferring down from the higher data handling layer to the lower data handling layer a data unit of the data sequence for which an acknowledgement of receipt was not received before the transmitting link was broken.

15 15. A data transfer procedure as claimed in any of claims 9 to 14, wherein the transmitting entity is a mobile station for a GPRS system.

16. A data transfer procedure as claimed in claim 15, wherein the higher data handling layer is an SNDCP layer and the lower data handling layers is an LLC layer.

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17. A communication system comprising:

a transmitting entity for transmitting data of a data sequence, which transmitting entity comprises a higher data handling layer and a lower data handling layer;

a receiving entity for receiving the data of the data sequence, which receiving entity comprises a higher data handling layer and a lower data handling layer;

means for transferring down from the higher data handling layer of the transmitting entity to the lower data handling layer of the transmitting entity a data unit of the data sequence, which data unit comprises at least one segment;

means for transmitting via a transmission link between the transmitting entity and the receiving entity each of the at least one segment from the lower data handling level of the transmitting entity to the lower data handling level of the receiving entity,

means for sending an acknowledgement of receipt of the at least one segment from the lower data handling level of the receiving entity to the lower data handling level of the transmitting entity;

means for transferring up the at least one segment from the lower data handling layer of the receiving entity to the higher data handling layer of the receiving entity in data sequence order;

and wherein the higher data handling layer of the transmitting entity is arranged to retain the data unit until such time as an at least implied acknowledgement of receipt of earlier segments in the sequence is sent back from the receiving entity to the lower data handling level of the transmitting entity.

18. A communication system as claimed in claim 17, wherein the higher data handling layer of the transmitting entity comprises a store for storing the data unit, the data handling layer being arranged to retain the data unit in the store until the acknowledgement of receipt has been sent back, when the data unit is then removed from the store.

19. A communication system as claimed in claim 17 or 18, wherein the at least one segment of each data unit in the data sequence has a position in the data sequence, the lower data handling layer of the transmitting entity comprises a store for storing data pertaining to the position of the at least one segment transmitted therefrom, and
5 the lower data handling layer of the receiving entity comprises a store for storing data pertaining to the position of the at least one segment received thereby.

20. A communication system as claimed in claim 19, further comprising:
means for determining that the transmission link is broken; and
10 means for reestablishing the transmitting link by purging the stores of data in the lower data handling layers of both the transmitting entity and the receiving entity.

21. A communication system as claimed in claim 20, wherein the means for determining that the transmission link is broken is operable:
15 to cause the transmitting entity to wait for a period of time for the acknowledgement of receipt of at least one segment from the lower data handling level of the receiving entity;
to cause the lower data handling level of the transmitting entity to retransmit the at least one segment when the acknowledgement of receipt is not received;
20 to repeat the waiting and retransmitting; and
to decide that the link is broken after the waiting and retransmitting have been repeated a number of times.

22. A communication system as claimed in claim 21, further comprising:

means, operable when the transmitting link is reestablished, for transferring down from the higher data handling layer of the transmitting entity to the lower data handling layer of the transmitting entity a data unit of the data sequence for which an acknowledgement of receipt was not received before the transmitting link was broken.

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23. A communication system as claimed in any of claims 17 to 22, wherein the transmitting entity is a mobile station and the receiving entity is a serving GPRS support node in a GPRS system.

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24. A communication system as claimed in claim 23, wherein the higher data handling layers are both SNDCP layers and the lower data handling layers are both LLC layers.

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25. A transmitting entity for transmitting data of a data sequence for a receiving entity in a communications system, the transmitting entity comprising:

a higher data handling layer;

a lower data handling layer;

means for transferring down from the higher data handling layer to the lower data handling layer a data unit of the data sequence, which data unit comprises at

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least one segment;

means for transmitting on a transmission link from the lower data handling level each of the at least one segment for the receiving entity;

means for receiving at the lower data handling level an acknowledgement of receipt of the at least one segment from the receiving entity; and

means for causing the higher data handling layer to retain the data unit until such time as an at least implied acknowledgement of receipt of earlier segments in the sequence is received at the lower data handling level from the receiving entity.

5 26. A transmitting entity as claimed in claim 25, wherein the higher data handling layer comprises a store for storing the data unit, and the data unit is retained in the store until the acknowledgement of receipt has been received, when the data unit is then removed from the store.

10 27. A transmitting entity as claimed in claim 25 or 26, wherein the at least one segment of each data unit in the data sequence has a position in the data sequence, and the lower data handling layer comprises a store for storing data pertaining to the position of the at least one segment transmitted therefrom.

15 28. A transmitting entity as claimed in claim 27, further comprising:
means for determining that the transmission link is broken; and
means for reestablishing the transmitting link by purging the stores of data in the lower data handling layer.

20 29. A transmitting entity procedure as claimed in claim 28, wherein the means for determining that the transmission link is broken is operable:

to wait for a period of time for the acknowledgement of receipt of at least one segment from the receiving entity;

to cause the lower data handling level to retransmit the at least one segment
25 when the acknowledgement of receipt is not received;

to repeat the waiting and retransmitting; and

to decide that the link is broken after the waiting and retransmitting have been repeated a number of times.

5 30. A transmitting entity as claimed in claim 29, further comprising:

means for transferring down from the higher data handling layer to the lower data handling layer a data unit of the data sequence for which an acknowledgement of receipt was not received before the transmitting link was broken.

10 31. A transmitting entity as claimed in any of claims 25 to 30, wherein the transmitting entity is a mobile station for a GPRS system.

32. A transmitting entity as claimed in claim 31, wherein the higher data handling layer is an SNDCP layer and the lower data handling layers is an LLC layer.